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iVIEW

EDITOR'S PAGE

Teaching Appropriate Behavior, and What to Consider if That Fails

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The appropriate use criteria (AUC) have increased attention to the importance of patient selection as the foundation of quality imaging. *iJACC* has been proud to publish many of the landmark papers that have been at the foundation of this process. However, as all laboratories know, the decision to request an imaging test most commonly arises from a nonimaging specialist, very often a noncardiologist. The role of education is therefore central to the adoption of AUC, and we highlight the contribution by researchers at the Massachusetts General Hospital (1) and the accompanying editorial by Gibbons (2) of the Mayo Clinic.

The initial work on quality improvement projects related to selection for cardiovascular imaging related to single-photon emission computed tomography and coronary computed tomography angiography (3,4). Bhatia et al. (5) initially reported their experience with teaching AUC for transthoracic echocardiography in 2013. Similar to the present study (1), they previously focused on physicians in training, and using didactic teaching, pocket cards, and regular feedback, they demonstrated a reduction in inappropriate studies from 13% to 5% (5). However, in the case of observational studies, the improvement must always be understood in the context of potential confounders, including external influences, changes in the rate of admission between the study and control periods, and the impact of standardized terminology that might have favored test classification as appropriate, irrespective of the actual reason for testing (6). The present study (1) addressed some of these concerns, using for the first time a randomized trial methodology. As in the investigators' previous work, the trainees in the intervention group ordered a higher proportion of appropriate transthoracic echocardiographic examinations after the intervention, 81% versus 58% ($p < 0.001$).

The proposed model lights the route forward in relation to the educational needs of junior staff members. Previous publications on this topic in *iJACC* have described an alternative, successful approach with single-photon emission computed tomography that included the description of a Web-based community and quality improvement instrument (7). That paper had described a reduction of inappropriate cases from 10% to 5% ($p < 0.0001$) in response to the adoption of self-directed, quality improvement software and an interactive community. Unfortunately, however, other studies reported in *iJACC* have suggested that an educational strategy may not be effective for more senior staff members, whose practice is more established and who may be reluctant to change (3,8). For most referring physicians, a more direct means of either reward (2) or censure may be necessary.

The main alternative to seeking behavioral change is to enforce it at the point of ordering the test. This approach underpins the use of radiology benefit managers (RBM) for other imaging techniques, which has been shown to correlate well for appropriate ordering of stress echocardiography (8). Indeed, it seems likely that the wider use of RBM processes is what has actually contained the growth of imaging, although their use is not without controversy (9). Such an approach has been mimicked with software based on AUC (10). Both of these point-of-order approaches have the disadvantage of being relatively rigid, and they may deprive patients of

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access when individual circumstances would warrant testing. This is especially the case in the gray zone of appropriate testing, wherein patient characteristics make what seems on paper to be a borderline indication very appropriate. In a previous *iJACC* paper, Willens et al. (8) showed that an RBM would reject such tests between 13% and 42% of the time. The RBM approach also favors the classification of requests in such a way as to satisfy the AUC, when the actual driver of the test is actually inappropriate. This is perhaps the most pernicious risk, because hiding the actual indication for testing not only compromises the audit process but may color the interpretation of the scan.

In addition to education and control at the point of care, a third but often neglected approach has been laboratory-based auditing (11). It seems likely that in the future, laboratories would be held responsible for the performance of inappropriate tests, with the risk being a reduction in reimbursement. Thus, the reputational and economic risk of high levels of inappropriate use may outweigh the cost burden of performing an audit. The identification of "at-risk" studies for inappropriateness may be a means of enhancing the efficiency of the audit process. Common features of inappropriate studies include routine surveillance, evaluation of symptoms without other symptoms or signs of cardiac disease, studies with low pre-test probability of endocarditis or pulmonary embolism, situations in which the examination would not change management, and when a test is ordered by a noncardiologist (12).

There is no ready solution to the problem of improving patient selection for testing. At *iJACC*, we remain committed to contributing to the debate about how best to optimize the use of imaging resources.

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